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ABSTRACT

The purpose of this study was to provide a more complete understanding of the storage and retrieval processes of developmentally different youngsters. Forty-four second and fourth grade subjects were given a lesson consisting of 25 facts to learn and remember. Half of the group learned the facts in a context containing superordinate statements (topic sentences), the other half with coordinate (related) statements. Half of the subjects went through free recall sessions before the retention test while half did not. Significantly greater recall and recognition was found for second grade subjects going through coordinate learning and free recall retention treatments, and fourth grade subjects going through superordinate learning and straight retention treatments. Free recall sessions were taped and analyzed. Implications for cognitive-developmental research and instructional modes are discussed. (Author/MKM)

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The Effects of a Superordinate Context on the Learning and Retention of Facts for Second and Fourth Grade Children

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ABSTRACT

Forty-four second and fourth grade subjects were given a lesson consisting of 25 facts to learn and remember. Half the group learned the facts in a context containing superordinate statements (topic sentences), the other half with co-ordinate (related) statements. Half of the subjects went through free recall sessions before the retention test while half did not. Significantly greater recall and recognition was found for second grade subjects going through co-ordinate learning and free recall retention treatments, and fourth grade subjects going through superordinate learning and straight retention treatments. Free recall sessions were taped and analyzed. Implications for cognitive-developmental research and instructional modes are discussed.

The Effects of a Superordinate Context on the Learning and Retention of Facts for Second and Fourth Grade Children

INTRODUCTION

The effects of differential instructional modes on children's learning has long been an issue among theorists in educational psychology. Ausubel (1968) proposed that meaningful learning occurred when potentially meaningful ideas were incorporated into pre-existing cognitive structures and anchored through the use of "advance organizers." Rothkopf (1968) also found that text embedded questions, relevant to the material being remembered, produced marked effects on meaningful learning and retention. Extending these ideas, Gagne (1969) compared the relative effectiveness of providing fourth and fifth grade subjects with a superordinate context for the learning and retention of facts, and found that providing a "topic sentence" which organized following sentences, was more effective than a corollary condition in which co-ordinate sentences (other facts) were substituted for the topic sentences. In a later study, Gagne and Wiegand (1970) compared superordinate and co-ordinate manipulators at both learning and retention. In contrast to the earlier study, however, there was no advantage for the superordinate context at learning, but a superordinate context provided at retention did result in significantly higher

fact recognition. Gagne and Wiegand accounted for the discrepant results by noting that the later study had included only fourth grade subjects, alluding to developmental differences in subject performance.

In a replication and extension of the Gagne and Wiegand study, Cunningham, Pastore and Mizokawa (1974) explored the effects of developmental differences in children's learning. Third and fifth grade subjects were given a combination of superordinate (topic) and/or co-ordinate (no topic) presentations at both learning and retention. Recall and recognition tests revealed that the topic-no topic (T-NT) combination was most conducive to both recognition and recall, indicating that children of this age group might learn more effectively if, given the cue to organize information, they are allowed to generate and use their own organizers. Although fifth grade subjects did relatively better than third grade subjects across treatments, distinct developmental differences in the storage and retrieval of information were not found.

The present study was set up to provide a more complete understanding of the storage and retrieval processes of developmentally different youngsters. Here, second and fourth grade subjects were given differential learning treatments and their performance on recognition, cued recall and free recall tasks was examined.

METHOD

Subjects

Forty-four second and fourth grade students from a local elementary school served as subjects. Ages ranged from 7.5 to 11.5 years. Groups were divided approximately evenly by sex, and subjects were randomly assigned to one of four experimental treatments, within classes.

Design and Procedures

A 2 x 2 x 2 factorial design was used. Factor one was learning treatment (superordinate or co-ordinate), factor two, retention treatment (free recall or straight retention), and factor three, grade level (second or fourth). Classes were divided into two groups, with one group being taken to another room, the other remaining in class. This procedure was counterbalanced across treatments.

After an introductory talk accompanied by slides, the subjects were given a 25 sentence lesson on Howler monkeys, presented one sentence at a time. The sentences (facts) were presented on slides (projected on a screen) and read twice to the subjects. The subjects followed along in booklets provided them, filling in a key word which was deleted from each sentence in their booklets. The subjects were instructed to simply copy the missing word off the screen into their booklets (this copying procedure provided assurance that the material was initially learned). During the second reading of the sentence,

the word "blank" was used where appropriate. The total inter-item interval was approximately 20 seconds.

Superordinate and co-ordinate learning treatments differed in two ways. Before each set of five slides, a blank slide appeared on the screen for five seconds. During this interval in the superordinate condition, the experimenter said, "This sentence tells what the next few are all about," and a sentence which presumably organized the next four sentences, followed. In the co-ordinate condition, the experimenter said, "The next few sentences go together," and a sentence with a fact parallel to the next four followed. The superordinate or co-ordinate sentences appeared at positions 1, 6, 11, 16 and 21. The other 20 context sentences were identical in both conditions.

Two days later the subjects were reassembled for the retention sessions. Each learning group was divided again, one half going to free recall (FR) sessions before the retention test, the remaining half going straight to the retention test. The subjects in the free recall group were taken one at a time to a separate room where each subject's responses were taped. Following that, they were assembled in a group and given the retention test.

There were five facts which the experimenter determined to assess for retention. These appeared two slides after the superordinate or co-ordinate sentence

in each set of five, at positions 3, 8, 13, 18 and 23. Retention was measured by means of a five page booklet. each page of which contained four sentences with a blank. One of the sentences on each page was a paraphrase of the fact to be remembered, the other three misleads. The subjects were to check the fact they had learned (providing a measure of recognition) and were then to complete the blank (providing a measure of recall). To account for variance in reading ability, all retention materials were read aloud to the subjects by an unbiased reader who had no knowledge of the learned materials.

RESULTS

Separate analyses of variance were conducted on recognition, recall given recognition with synonyms allowed, and verbatim recall given recognition.

Recognition resulted in a significant learning X grade level interaction, with second grade subjects performing better on the co-ordinate (no topic) learning treatment while fourth grade subjects performed better on the superordinate (topic sentence) treatment, F (1,43) = 4.71, $p < .05$.

Recall given recognition with synonyms allowed resulted in a significant retention X grade level interaction, F (1,43) = 4.02, $p < .05$, with free recall sessions prior to the retention test facilitating second grade subject recall and not facilitating (perhaps inter-

ferring with) fourth grade subject recall.

Verbatim recall given recognition resulted in a significant main effect for retention treatment, with the straight retention test, rather than the free recall session before retention, resulting in significantly better verbatim recall, $F(1,45) = 4.27$, $p < .05$.

All three measures resulted in a significant main effect for grade level, with fourth grade subjects performing better than second grade subjects.

A descriptive analysis of the free recall sessions resulted in a word, idea and correct idea count. A t-test of significance was run on item combinations.

The word count analysis revealed that fourth grade subjects produced more words during free recall sessions. Fourth grade subjects in the superordinate (topic sentence) learning condition had a slightly higher word count than other groups.

The idea and correct idea count revealed similar results. A significant ($p < .01$) idea and correct idea count for fourth grade subjects, with topic (T) fourth grade subjects and no topic (NT) second grade subjects performing better than other learning treatment X grade level groups.

All three measures resulted in higher male performance, with fourth grade male word count resulting in significantly higher totals than fourth grade female word count, $t(42) = 2.08$, $p < .05$.

DISCUSSION

Cunningham, Pastore and Mizokawa (1974) interpreted their data to indicate that third and fifth grade youngsters might learn more effectively if, given the cue to organize information, they are allowed to devise and use their own organizers. The significant learning X retention treatment interactions for this study clarify and extend those conclusions.

Second grade subjects performed better on recognition when the learning treatment focused attention on the structural elements of the sentences. The lead-in sentence ("The next few sentences go together") and the first (organizer) sentence in each group, provided cues that focused the subjects on the content and style of following sentences. Conversely, fourth grade subjects performed better when their attention was focused on the meaning of the sentences. The lead-in sentence ("This sentence tells what the next few are all about.") and the first (organizer) sentence, in this treatment, provided semantic cues for subjects.

Likewise, results for recall (given recognition with synonyms allowed) showed second grade subjects performing better when given a free recall session that might have structurally organized thinking processes. For fourth grade subjects, however, extra structure provided at retention appeared to interfere with processing. Cunningham, Pastore and Mizokawa (1974) also found that adding

structure (topic sentences) at retention interferred with processing, especially for older (fifth grade) subjects.

Information from free recall sessions supplemented the preceding results: superordinate learning treatment fourth grade subjects and co-ordinate learning treatment second grade subjects performed better on free recall tasks. Additionally, the free recall sessions provided further information on the distinct processing skills of the different groups. For example, second grade subjects tended to remember isolated facts, brought up one at a time. Also, second grade subjects attempted to give verbatim responses. Fourth grade subjects, however, tended to remember groups of items - their statements readily leading from one item to another. These groups of items were normally organized around a theme (such as "all the things monkeys do in trees") and appeared to be connected semantically. Additionally, fourth grade subjects paraphrased more readily and used synonyms more frequently during the free recall sessions.

The sex difference in free recall performance added further information concerning child processing. It appeared that the subjects, especially fourth grade subjects, often remembered sex-appropriate facts - i.e. boys remembered action-male oriented facts while girls remembered domestic-female oriented ones. The protocol inad-

vertently included many more action-male oriented facts than domestic-female oriented ones, and may have contributed to the lower female free recall responses.

To summarize, this study showed that younger children appear to process information through the use of perceptual, or structural, cues. Conversely, older children appear to process through the use of semantic cues, organizing information into meaningful units, tying information together with organizational schemes relevant to them. Older children use techniques that make the storage and retrieval processes more efficient.

These differences in child processing correlate well with the different characteristics of children in the developmental stages of concrete and abstract operations outlined by Piaget (1960). According to Piaget, children in beginning concrete operations (normally between the ages of seven to eight, as the second grade subjects in this study were) are bound by external phenomenon in their understanding of events. Perceptual cues, both auditory and visual, influence their comprehension. Children in beginning abstract operations (normally between the ages of 10 to 11, as the fourth grade subjects in this study were) are not as externally bound, but are more capable of internal organization and are therefore, able to abstract rules or principles, to use in comprehending events. They have the ability to understand at

a deeper, more semantic level and can make generalizations that enable them to process information more effectively (Piaget and Inhelder, 1969).

Results from this study provide insights into the storage and retrieval processes of developmentally different children. These results have implications for both cognitive developmental research in this area, and instructional theory and practice, especially in the area of reading or language arts.

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